UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

DATE: May 22, 1998

SUBJECT: Modeling Parameters for Focused Ecological Risk Assessment of Wetland Rails at the American Chemical Services Site, Griffith, IN

FROM: James Chapman, Ph.D., Ecologist, Remedial Response Section #1

TO: Sheri Bianchin, RPM

This memo provides modeling parameters for use in a focused ecological risk assessment (ERA) of potential effects of wetland PCB contamination on insectivorous receptors as represented by the Virginia rail.

The rationale for focusing on rails (Family Rallidae) is several-fold the wetland PCB contamination at the ACS site is concentrated in a relatively small area, therefore a receptor with a small home range is preferable for assessing potential ecological effects; rails are common inhabitants of marshes and have small home ranges; several rail species potentially utilize the ACS wetland; and most of the rail species have predominantly insectivorous diets, the expected primary exposure pathway for wetland PCBs.

The following species may occur in the ACS wetlands:

<u>Species</u>	<u>Primary diet</u> (Sanderson 1977; Martin, et al. 1951)
Virginia rail (*Rallus limicola*)	larval and adult insects, snails, crustaceans, and small fish; plant food typically comprises less than 10% of the diet during the reproductive season
King rail (*Rallus elegans*)	crustaceans (crayfish) and other aquatic animals including amphibians and small fish
Sora (*Porzana carolina*)	mollusks, insects, and seeds (plant food may predominate in freshwater marshes)
Black rail (*Laterallus jamaicensis*)	not well known, insects and other invertebrates

Exposure to wetland sediment PCBs could occur through the following pathways:

1) sediment/soil ➔ receptor (incidental ingestion)
2) sediment/soil ➔ insect larvae/other invertebrates ➔ receptor
3) sediment/soil ➔ insect larvae ➔ adult insects (adult insects may be aquatic, terrestrial or aerial) ➔ receptor
4) sediment ➔ benthic invertebrates/detritus ➔ fish/crayfish ➔ receptor
5) sediment/soil ➔ multiple pathways ➔ amphibians ➔ receptor
6) sediment ➔ water column ➔ aquatic plants ➔ receptor
7) sediment/soil ➔ rooted aquatic/terrestrial plants ➔ receptor

Pathways 2 and 3 are likely to result in the greatest exposures. Pathways 6 and 7 are probably insignificant (with the caveat that algal uptake may be significant). Pathway 4 would be a major exposure route in a purely aquatic system, but is of uncertain significance in a wetland that has standing water only part of the year. Pathway 5 is difficult to estimate without biosampling, and is not likely to indicate risk levels appreciably greater than those associated with pathways 2 and 3 (since much of the amphibian exposure occurs through insectivory). Risks to amphibians may be as or more significant than their role as an exposure pathway for other receptors, but the data base for estimating effects on amphibians is meager.

The Virginia rail is the recommended measurement endpoint because it feeds by probing for food (as opposed to gleaning from the surface) and much of its prey are themselves predaceous (Sanderson 1977). The following modeling parameters are recommended:

Mean body mass - 74.9 g (fw) (female) (Dunning 1993)
Food ingestion rate - calculate from allometric equations (USEPA 1993)
Home range - calculate from mean of 1.8 breeding pairs per hectare (Sanderson 1977)
Incidental soil ingestion - 10.4% (based on American woodcock) (Beyer et al. 1994)

Bioaccumulation of PCBs by invertebrate prey should be estimated by earthworm uptake. The mean accumulation factor for PCBs by 2 species of earthworms from 2 different soils is 11 on a dw/dw basis (PCB earthworm dw/PCB soil dw) (calculated from Table 3 of Kreis et al 1987). Assume 90% moisture content to convert the calculated invertebrate PCB concentration to a freshweight basis (Edwards and Bohlen 1996).

I may be contacted at 6-7195 if you have questions or comments. Please fill out the attached evaluation form and return it to Larry Schmitt, SR-6J. The information is used to assess and improve our services.

cc: Larry Schmitt, Section Chief, RRS #1

Literature Cited

Beyer, W., E. Connor and S. Gerould. 1994. Estimates of soil ingestion by wildlife. J Wildl Manage 58: 375-382.

Dunning Jr., J. (ed.) 1993. CRC Handbook of Avian Body Masses. CRC Press, Boca Raton.

Edwards, C. and P. Bohlen. 1996. Biology and Ecology of Earthworms, 3rd ed. Chapman & Hall, New York. 426 p.

Kreis, B., P. Edwards, G. Cuendet and J. Tarradellas. 1987. The dynamics of RCBs [*sic*] between earthworm populations and agricultural soils. Pedobiologia 30: 379-388.

Martin, A., H. Zim and A. Nelson. 1951. American Wildlife & Plants, A Guide to Wildlife Food Habits. reprinted 1961. Dover Publ., New York. 500 p.

Sanderson, G. (ed.). 1977. Management of Migratory Shore and Upland Game Birds in North America. reprinted 1980. Univ. Nebraska Press, Lincoln. 358 p.

USEPA. 1993. Wildlife Exposure Factors Handbook. vol. I and II. Office of Research and Development. EPA/600/R-93/187a and b.